DESIGN AND FABRICATION OF AN AUTONOMOUS WHEELCHAIR FOR DISABLED PERSONS

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ABSTRACT:
In this paper, a Gesture control systems to drive a smart wheelchair is proposed. The proposed Gesture control systems permits to the user to select one of four commands to drive the wheelchair. Once a command is selected, the control system executes the selected command and, at the same time, monitors the emotional state of the user. While the user is satisfied, the selected command is still executed and when the user becomes unsatisfied, the control system will stop the wheelchair and ask the user to select another command.

KEYWORDS: Ultrasonic Sensors, Flex Sensor, Auto vision, Gestures, Signals, Arduino

1. INTRODUCTION

Electrical wheelchairs are widely used to help disabled people moving around their environments. However, many of them have difficulties to drive their wheelchairs especially in narrow places. To overcome this problem, several techniques were proposed to assist people in driving their wheelchairs\textsuperscript{[1-5]}. Gesture control systems is one of these techniques that help users controlling their wheelchairs by brainwave signals\textsuperscript{[7-9]}. However, these techniques require the concentration of the user all the time in external stimuli in order to generate a recognized mental state that limits the use of these techniques practically\textsuperscript{[6]}.

In the other hand, emotions are important communication ways with the users. Recent studies proposed new methods to recognize the user’s emotional state from measured brainwave signals.

In this paper, we propose an Gesture control systems to drive a smart wheelchair. The proposed Gesture control systems permits to the user to select one of four commands to drive the wheelchair: move forward, move backward, turn left, and turn right\textsuperscript{[10-15]}. Once a command is selected, there is no need for the user to concentrate in external stimuli. The control system executes the selected command and, at the same time, monitors the state of the user\textsuperscript{[16,17]}. While the user is satisfied, the selected command is still executed and when the user becomes unsatisfied, the control system will stop the wheelchair and ask the user to select another command\textsuperscript{[21]}.

The rest of the paper is organized as follows. In Section 2, a brief description of Gesture systems is given. In Section 3, the proposed emotional Gesture control systems is explained. Experiments and results are given in Section 4. Section 5 is devoted to concluding remarks and future works\textsuperscript{[22-25]}. 
II. GESTURE SYSTEMS

Gesture control systems are compound techniques that permit a direct communication using flex sensors. A Gesture system is usually composed of three main units: signal acquisition unit, signal analysis unit, and action unit.

Signal acquisition unit consists of flex sensors and signal processing unit. The flex sensors are distributed on the scalp according to an international system such that meaningful signals can be acquired. The signal processing unit amplifies the acquired signals and removes noises and possible artifacts from the acquired signals.

The signal analysis unit extracts features from input signals and classifies them into distinct classes according to extracted features. A wide range of feature extraction methods and classification methods were proposed and used in literature. The action unit converts classified signals into discrete control signals that can be used to control an external application.

III. TEXT INPAINTING

In this section, the proposed emotional Gesture control systems is described in detail. A general description of the proposed system is depicted in Fig. 1.

![Fig. 1. Proposed system](image)

**Signal Acquisition Unit**

The signal acquisition unit used in our system. By using the flex sensor the signal is acquired and that can be used and send those signals to the Microcontroller.

**Signal Processing Unit**

The signal processing unit used in our system is the Arduino ATMEGA-32 (Fig. 2) Microcontroller we is used as the brain of the system. It has many type of A/D circuits and that can be connected and programmed to a dedicated software which is called Arduino at the corresponding bit rate of the Operating system in the PC or MAC.
Fig. 2 Arduino ATMEGA-32

This Microcontroller works when each movements of the flex sensors are connected and then if the flex sensor is bended more than its threshold frequency till the minimal to the maximum then, it responds to its corresponding actions. And instantly it sends to the Motor driver circuit and that can sends the signals to the Motor[18,19].

**Action Unit**

At the beginning we discussed, each flex sensors has the each movements like left, right, forward and backward. Therefore there are four flex sensors which is placed on the finger by capturing gestures shown in fig. 3., when the finger bends to the maximum amount of threshold frequency.

Fig. 3 Flex sensor

The application considered in this work is the Autonomous Vehicle for People along with the Joystick movements. These systems are also enhanced for the betterment of the patient usage shown in fig 4.

Fig.4 Autonomous Wheel chair

**IV. Experimental results**

Our smart wheel chair is functioned by flex sensor with the help of hand gestures. In this project, the DC motor and its drives are used and the improvement of the efficiency and torque is increased. Interfacing with the Micro controller Arduino mega to the other components in the circuit and the
power supply flow is done. By toggling the joystick movements to front, back, left & right nearly maximum amount of response is given by the motor to the wheels. The previous chapters we have dealt about the list of diseases like glaucoma, hepatitis c, and breast cancer, so on. And these are required for wheelchair were identified.

V. CONCLUSION

We have implemented an automatic wheel chair by using flex sensor. Our algorithm successfully detects obstacles from the region. Our wheelchair can be made which can be operated by a Joystick. Output of sensor can be applied to wire transmitter circuit and can received at wheelchair circuit by receiver circuitry[21]. So, GPS module operation can arrange and display the information. Instead of using acceleration motion (eyebrow Movement), in future we can use IOT based human machine interface to move wheelchair in different direction. Using retina movement, we would be able to drive a wheelchair. We can use voice command IC to interface our voice signals with microcontroller.

REFERENCES


